CLAIMS

What is claimed is:

1. An assay system comprising:

a channel bounded by first and second reflective surfaces adapted to accommodate therebetween a fluid having material to be tested;

a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a resonant cavity and adapted to receive a capturing material on one of the first and second surfaces therein;

a source of radiation to illuminate each region at a wavelength adapted to provide a standing wave of radiation within each said cavity;

a detector for the radiation in each said cavity and operative to indicate a change in the standing wave pattern, reflective of binding of capturing material with material in a fluid within each said cavity.

2. An assay system comprising:

a channel bounded by first and second reflective surfaces adapted to accommodate therebetween a fluid having material to be tested;

a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a cavity and adapted to receive a capturing material on one of the first and second surfaces therein;

a source of wavelength scanned radiation to illuminate each region at a wavelength adapted to provide a transmission of that radiation within each said cavity representative of material from said fluid bound to said capturing material;

a detector for the radiation in each said cavity and operative to indicate the level of binding by said capturing material of material in said fluid within each said cavity.

3. The assay system of claim 1 or 2 wherein said first and second reflective surfaces include one or more dielectric layers forming said reflective surface at a wavelength corresponding to said standing wave pattern.

4. The assay system of any previous claim wherein the capturing material of each respective cavity is of a nature to bind with different materials in the fluid.

5. The assay system of any previous claim wherein said capturing material as applied to each cavity forms a DNA or protein chip where individual capturing materials in each cavity are DNA or protein selective.

6. The assay system of any previous claim wherein said radiation source is an IR source.

7. The assay system of any previous claim wherein said radiation source is a laser source.

8. The assay system of any previous claim wherein said radiation source is a tunable laser source.

9. The assay system of claim 7 further including means for sweeping the wavelength of said tunable laser over a range including a wavelength corresponding to said standing wave pattern in each cavity.

10. The assay system of any previous claim further including a beam expander in a path of radiation between said radiation source and said channel.

11. The assay system of any previous claim further including a beam condenser in a path of radiation between said channel and said detector.

12. The assay system of any previous claim wherein said detector includes a multi element detector wherein each element receives radiation from a corresponding cavity.

13. The assay system of any previous claim wherein said detector is a CCD detector.

14. The assay system of any previous claim wherein said first and second surfaces are parallel and radiation from said source is applied othogonally to said first and second surfaces.

15. The assay system of any one of previous claims 1 to 12 wherein said radiation is applied obliquely to at least one of said first and second surfaces.

16. The assay system of any previous claim wherein said detector detects one or more of radiation amplitude, phase, polarization and wavelength.

17. The assay system of any one of previous claims 1 to 6 wherein said source of radiation includes means for causing said radiation to emit at discrete different wavelengths.

18. The assay system of any previous claim including means for controlling a temperature of fluid within said channel.

19. The assay system of any previous claim further including means for dynamically varying spacing of said first and second surfaces.

20. The assay system of any previous claim wherein said detection system includes a photodetector array integral with a support for one of said reflective surfaces which is not supporting a capturing material.

21. The assay system of any previous claim wherein said reflective surface having said capturing material thereon has an added dielectric layer to provide a peak in a standing wave pattern in said cavity at said capturing material.

22. The assay system of any previous claim further including means for varying the spacing of said reflective surfaces to vary the cavity resonance condition.

23. A method for assaying comprising:

providing a channel bounded by first and second reflective surfaces adapted to accommodate a fluid material therebetween;

providing a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a resonant cavity and adapted to receive a capturing material on one of the first and second surfaces therein;

applying radiation to illuminate each region at a wavelength adapted to provide a standing wave of radiation within each said cavity;

detecting the radiation in each said cavity and operative to indicate a change in the standing wave pattern reflective of binding of capturing material with material in a fluid within each said cavity.

24. A Method for assaying comprising:

providing a channel bounded by first and second reflective surfaces adapted to accommodate therebetween a fluid having material to be tested;

providing a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a cavity and adapted to receive a capturing material on one of the first and second surfaces therein;

scanning source of radiation applied to illuminate each region at a wavelength adapted to provide a transmission of that radiation within each said cavity representative of material from said fluid bound to said capturing material;

detecting the radiation in each said cavity and operative to indicate the level of binding by said capturing material of material in said fluid within each said cavity.

25. The assay method of claim 23 or 24 wherein said first and second reflective surfaces include one or more dielectric layers forming said reflective surface at a wavelength corresponding to said standing wave pattern.

26. The assay method of any one of previous claims 23 to 25 wherein the capturing material of each respective cavity is of a nature to bind with different materials in the fluid.

27. The assay method of any of previous claims 23 to 26 wherein said capturing material as applied to each cavity is provided as a DNA or protein chip where individual capturing materials in each cavity are DNA or protein selective.

28. The assay method of any of previous claims 23 to 27 wherein said radiation is IR.

29. The assay method of any of previous claims 23 to 27 wherein said radiation is laser radiation.

30. The assay method of any of previous claims 23 to 29 including the step of tuning said radiation.

31. The assay method of claim 30 further including the step of sweeping the wavelength of said radiation over a range including a wavelength corresponding to said standing wave pattern in each cavity.

32. The assay method of any of previous claims 23 to 31 further including the step of expand said radiation in a beam along a path of radiation between said radiation source and said channel.

33. The assay method of any of previous claims 23 to 32 further including the step of condensing a beam of radiation along a path of radiation between said channel and said detector.

34. The assay method of any of previous claims 23 to 33 wherein said detecting step includes detecting in each of a plurality of detection elements wherein each element receives radiation from a corresponding cavity.

35. The assay method of any of previous claims 23 to 34 wherein said first and second surfaces are parallel and radiation from said source is applied othogonally to said first and second surfaces.

36. The assay method of any one of previous claims 23 to 35 wherein said radiation is applied obliquely to at least one of said first and second surfaces.

37. The assay method of any of previous claims 239 to 36 wherein said detection step detects one or more of radiation amplitude, phase, polarization and wavelength.

38. The assay method of any one of previous claims 23 to 37 wherein said radiation is emitted at discrete, different wavelengths.

39. The assay method of any of previous claims 23 to 38 including the step of controlling a temperature of fluid within said channel.

40. The assay method of any of previous claims 23 to 39 further including the step of dynamically varying spacing of said first and second surfaces.

41. The assaying method of any previous claims 23 through 40 wherein said detecting step includes detecting at a photodetector array integral with a support for one of said reflective surfaces which is not supporting a capturing material.

42. The assaying method of any of claims 23 through 41 wherein said reflective surface is provided having said capturing material thereon has an added dielectric layer to provide a peak in a standing wave pattern in said cavity at said capturing material.

43. The assay system of any of claims 23 through 42 further including varying the spacing of said reflective surfaces to vary the cavity resonance conditions.

44. An assay system comprising:

a zone bounded by first and second reflective surfaces adapted to accommodate therebetween a material to be tested;

a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a resonant cavity between the first and second surfaces therein;

a source of radiation to illuminate each region at a wavelength adapted to provide a standing wave of radiation within each said cavity;

a detector for the radiation in each said cavity and operative to indicate a change in the standing wave pattern reflective material within each said cavity.

45. An assay system comprising:

a channel bounded by first and second reflective surfaces adapted to accommodate therebetween a material to be tested;

a plurality of regions in a pattern of an array between said first and second surfaces, each region defining a cavity between the first and second surfaces therein;

a source of wavelength scanned radiation to illuminate each region at a wavelength adapted to provide a transmission of that radiation within each said cavity representative of said material;

a detector for the radiation in each said cavity and operative to indicate the level material within each said cavity.